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Set     Items   Description
S1         21   DEMANUFACTURING AND DISASSEMBLY
S2         19   RD S1 (unique items)
S3          3   S2 AND SCHEDULING
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8-26-05

T S3/3,K/ALL

3/3,K/1 (Item 1 from file: 15)
DIALOG(R)File 15:ABI/Inform(R)

02573508 214411921
Manufacturing's role in corporate environmental sustainability: Concerns for the new millennium
Sarkis, Joseph
International Journal of Operations & Production Management v21n5/6 PP: 666-686 2001
ISSN: 0144-3577 JRNL CODE: IJO
WORD COUNT: 8288

...TEXT: industry, providing a current technological advantage for Kennedy.

Remanufacturing and reuse require some refurbishing and **disassembly** process capabilities. Processing equipment that is capable of cleaning and maintaining products is one of...

...products is relatively manual. The development of automated systems (which, in parallel with design for **disassembly** practices) will become necessary as these markets and pressures on remanufacturing, recycling and reuse increase...responsible for the product and its materials over the life of the product.
Designing for **disassembly** (DFD) will also prove to be necessary for sustainable products. The main principles of DFD...

...the idea of evaluating products and processes based on environmental characteristics. For example, in a **demanufacturing** plant, workers were trained and made aware, within a manual sorting process, of the importance ...issue is the integration of reverse bills of material that will aid in managing inventory **disassembly** of products (Krupp, 1993). The planning and forecasting for material flows into a system will...

...uncertainty is due to the immature reverse logistics channels in most manufacturing industries. Completing master **scheduling** plans for materials that organizations have little control over is also a concern (Guide et...

...systems, algorithms are also currently in development by researchers. For example, there are models for **scheduling** of returned or remanufacturable products (Guide et al., 1997) and **disassembly** process planning (Beasley and Martin, 1993; Moore et al., 1998), to name a few.

Once...Xerox could call its copiers environmentally sound. Its asset recovery operations, which is primarily a **disassembly** plant, was seen as a competitive advantage to Rank Xerox. Not only was it saving...

...remanufacturing and recycling were thus made strategic.

Another dimension of marketing and services associated with **demanufacturing** and **disassembly** from a marketing (and profitability) perspective is evidenced by Digital's (now Compaq) materials recovery...

...that can be offered by Digital. By building this capability, Digital was able to offer **disassembly** services to its customers and other electronics manufacturers as part of a whole service package...

...a product includes the efforts to discern the impacts of substitutions of materials, designs for **disassembly** and for the environment, and continuous improvement efforts geared towards reduction of waste.

Tracking systems...relate to manufacturing organizations and corporate sustainability.

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3/3,K/2 (Item 2 from file: 15)

DIALOG(R)File 15:ABI/Inform(R)

02525360 278510531

Disassembly **modeling, planning, and application**

Tang, Ying; Zhou, MengChu; Zussman, Eyal; Caudill, Reggie

Journal of Manufacturing Systems v21n3 PP: 200-217 2002
ISSN: 0278-6125 JRNL CODE: JMY
WORD COUNT: 2973

Disassembly **modeling, planning, and application**

...ABSTRACT: in importance due to increasing environmental and economic pressures. Industrial recycling and remanufacturing involves product **disassembly** to retrieve the desired parts and/or subassemblies by separating a product into its constituents. **Disassembly** modeling and planning is more challenging than assembly because its terminal goal is not necessarily...

...may depend on product usage and market demands for used parts and recycled materials. Moreover, **disassembly** is accompanied by more uncertainty in system structures and component conditions than is assembly. This paper presents recent methods for modeling and process planning in **disassembly** and the applications to industrial products. The main purpose

of this paper is to survey...
...TEXT: in importance due to increasing environmental and economic pressures. Industrial recycling and remanufacturing involves product **disassembly** to retrieve the desired parts and/or subassemblies by separating a product into its constituents. **Disassembly** modeling and planning is more challenging than assembly because its terminal goal is not necessarily...

...may depend on product usage and market demands for used parts and recycled materials. Moreover, **disassembly** is accompanied by more uncertainty in system structures and component conditions than is assembly. This paper presents recent methods for modeling and process planning in **disassembly** and the applications to industrial products. The main purpose of this paper is to survey...

...of the art of this emerging area to supply important information for future study.

Keywords: **Disassembly** , Petri Nets, Planning, Systems Modeling, **Demanufacturing** Systems

Introduction
Over the last few years, the awareness of conserving energy, material resources, and...

...of research has focused on the design of products from an environment perspective (design for **disassembly** , design for environment, design for recycling) (NavinChandra 1991; Fiksel 1996; Beitz 1993; Kirby and Wadehra 1993; Scheuring, Bras, Lee 1994; Shu and Flowers 1999; Gungor and Gupta 1999c), **disassembly** still plays an important role in material and product recovery, due to the millions of products that have already been developed without considering their undesired effects on the environment. **Disassembly** serves to extract hazardous substances from the systems, to reutilize valuable raw materials and components...

...waste that must be disposed of in special-purpose landfills. The research issues in the **disassembly** field can be grouped into three major areas: (1) modeling and representation of product **disassembly** sequences; (2) **disassembly** process planning, which includes the extent to which **disassembly** of a product should be performed, and how to decide an optimal **disassembly** sequence; and (3) **disassembly** system design and line balancing (Gungor and Gupta 1999a,b).

This paper is limited to...
...recent methodology and technology development activities in the first and second research areas. Issues about **disassembly** system design are not considered.

Modeling **Disassembly** Processes

In a product **disassembly** process, choosing the representation of **disassembly** sequences is an important decision not only in creating a **disassembly** sequence planner but also in designing an intelligent control system for a **disassembly** system. The objective is to efficiently represent all feasible and complete **disassembly** sequences with correct precedence relations. A number of modeling strategies exist. They can be categorized...

...Whitney 1987); (3) AND/OR graph (Homem de Mello and Sanderson 1990, 1991); and (4) **disassembly** Petri net (Cao and Sanderson 1995, 1998;

Moore, Gungor, Gupta 1998a, 1998b; Suzuki et al...

...n is the number of components in a product. Connection Graph/Component-Mating Graph

Conclusion

Disassembly for reuse and recycling purposes is an emerging field of research that has many advantages over such traditional methods as shredding. Fleischmann et al. (1997) reviewed an interesting platform for **disassembly** , namely, reverse logistics. Gungor and Gupta (1999c) presented a review of literature on environmentally conscious manufacturing and product recovery and mentioned **disassembly** as an important component of remanufacture. This paper presents a synopsis of ongoing research in process modeling and planning of **disassembly** , and their applications.

Figure 1

The fundamental approach to modeling the **disassembly** processes is based on liaison analysis of endof-life products. The advantages of AND/OR graphs, Petri nets, and connection graphs or component-mating graphs used in the **disassembly** modeling process are not only to deal with large and complex systems, but also to...

...process. Moreover, Petri nets can be used to facilitate the controller design for the resulting **disassembly** systems.

The **disassembly** planning process is the heart of **disassembly** execution. The key question is how quickly the algorithm can generate a good solution for...

...However, based on current research, it is not easy to reduce the complexity for a **disassembly** planning method. Some approaches make it possible just for special cases, for example, the WP approach for selective **disassembly** (Srinivasan and Gadh 1998a,b); and MAXREV (Meacham, Uzsoy, Venkatadri 1999) under the assumption that...

...a large number of industrial products. Such studies will help engineers to select most appropriate **disassembly** process planning methods for their particular industrial use.

Most of the present research works on **disassembly** focus on the generation ...an interesting future research topic is how to consider the uncertainty and address a dynamic **disassembly** system reactive to unpredictable events. Although Zussman et al. (Geiger and Zussman 1996, Zussman and Zhou 1999) presented some excellent ideas using a **disassembly** Petri net and Bayesian network, the development of efficient algorithms in real-time **disassembly** systems and industrial products is yet to be undertaken.

Moreover, in the current study of **disassembly** , resources, human beings, and tools in the system are assumed sufficient. However, in fact, such conditions may not be true in an actual **disassembly** operation. Therefore, it is worthy to explore how to deal with the limitation of some resources and identify an efficient **scheduling** policy (Tang, Zhou, Caudill 2001). To the authors' knowledge, few papers deal with such problems in **disassembly** . Some technologies for assembly (e.g., Thomas, Nissanke, Baker 1996) should be extended further to **disassembly** studies.

Disassembly is currently labor intensive and expensive. Thus, it is very important to develop automated **disassembly** systems that may eliminate the drawbacks of manual work, that is, lengthy **disassembly** completion time,

human exposure to possible perilous materials and byproducts, and so on. Although the current development of **disassembly** systems is encouraging, to implement variant efficient **disassembly** methodologies into an intelligent robotic system for **disassembly** is still a daunting task.

As we know, **disassembly** is an important part of remanufacturing systems. Refurbished electronic products becoming popular in the market...

...it possible to reduce the production cost. How to consider the whole process from the **disassembly** to reassembly is a complicated and challenging issue. Due to ecological and economic reasons, **disassembly** becomes increasingly important. It is clear that more **disassembly** research and development is needed to fulfill the goal of sustainable development.

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Ying Tang, Dept. of Electrical...

...of electrical and computer engineering at Rowan University. Her research interests include modeling, design, and **scheduling** of computer-integrated manufacturing and **demanufacturing** systems, Petri nets, computer networks, and discrete event systems. Dr. Tang received the Best Student...of Technology. His research interests include lifecycle assessment and design, design for the environment, and **demanufacturing** automation.

3/3,K/3 (Item 3 from file: 15)
DIALOG(R)File 15:ABI/Inform(R)

02302853 84988050
Method for automatic tool selection for disassembly **planning**
O'Shea, Benjamin; Kaebernick, Hartmut; Grewal, S S; Perlewitz, H; Muller, K ; Seliger, G
Assembly Automation v19n1 PP: 47 1999
ISSN: 0144-5154 JRNL CODE: AAU
WORD COUNT: 3346

Method for automatic tool selection for disassembly **planning**

ABSTRACT: The need for a method for automatic tool selection in **disassembly** planning has become apparent when planning for the **disassembly** of products in flexible manufacturing (**demanufacturing**) cells. The aim of this automatic tool selection process is to decide on the optimum tool selection given that a number of possible tool options exist for the assembly or **disassembly** of a given component. The problem is solved by representing the product in such a...
...TEXT: variety of product models, uncertain volumes and unknown components and material properties. Often during the **disassembly** process the opportunity exists to apply one of a variety of potential tools to disassemble...

...a decision needs to be made as to whether to use destructive or non-destructive **disassembly** techniques to break a particular joint. Or it may occur when deciding to use manual, semi-automated or fully automated **disassembly** processes. Consequently a method for automatic tool selection in **disassembly** planning is required. This method should be applicable either to the problem of automatic tool selection in an existing **disassembly** cell or to the decision for the use of one tool over another in a **disassembly** cell in the design phase. The decision for tool selection in the **disassembly** process is based on three broad factors. These factors are:

(1) Reliability. Each tool that is considered as potentially useful in the **disassembly** of a particular connection within a product must possess suitable characteristics of accuracy and repeatability. That is, the tool must be reliable.

(2) Cost. The future **disassembly** of products will be driven by economic as much as environmental factors. The minimization of cost in the **disassembly** of products is critical to the future growth of a life cycle industry.

(3) Environmental factors. Clearly **disassembly** processes of an environmentally unsuitable nature are counter to **disassembly** planning and its place within the broader field of life cycle engineering.

Ideally, **disassembly** should be carried out to recycle and reuse components and subassemblies in new products. However...

...environmental factors. The product to be disassembled is taken at the design phase of the **disassembly** process. The **disassembly** process should ideally be designed at the product design phase for future products but for ...

...At this collection phase approximate numbers of used products can be estimated. From this data **disassembly** planning can be carried out to find effective break-even points for the disasssembly of products.

The need for a method for automatic tool selection in **disassembly** planning has become apparent when planning for the **disassembly** of products in flexible manufacturing (**demanufacturing**) cells. As a family of products is disassembled within a specific cell the addition of...

...product family raises the question: which tools within the cell should be used for the **disassembly** of the product? It often occurs that two or more different processing tools can be...

...agent or remove a specific component. As it is refined for application, specifically in a **disassembly** environment, it could also take issues such as component degradation into account.

Conversely, in an...

...method outlined here assumes that the reliability of tools selected and the environmental impact of **disassembly** processes is known, it concentrates on the cost minimization problem. As such, there is no reason why the concept outlined here, primarily for **disassembly** operations, could not be applied to assembly planning.

The aim of this automatic tool selection...

...tool selection given that a number of possible tool options exist for the assembly or **disassembly** of a given component. The problem is solved by representing the product in such a...By the nature of the dynamic model no two tools can be selected for the **disassembly** of the same component.

Application of the automatic tool selection method to a washing machine...

...by ordering the components of the product into rows orlevels according to their accessibility for **disassembly** . That is, components that appear in the first level of the cluster graph can bedisassembled...

...To this basic form of the cluster graph relevant information pertaining to tool options for **disassembly** can be added. Consequently to each component the range of potential **disassembly** tool options is marked in. Therefore, after each component in the product is entered into the graph, the tools that the **disassembly** planner believes can be used to

disassemble this component are marked into the graph next...

...one or more than one potential tool options. Components that require no particular tool for **disassembly** are marked with a null marker in the cluster graph. These may be components that...

...of the hands for example. Other components will possess only one potential tool option for **disassembly** . It is clear that components of this type require no automatic tool selection, since there...

...tool can be used.

Table II shows the explanations of the tool options for the **disassembly** of each component in the washing machine valve. For the purposes of simplicity in demonstrating...

...the product will be disassembled and that no clustering of components into groups or partial **disassembly** of the product will be considered.

Once the **disassembly** planner has allocated the potential tool options for each component in the cluster graph, tool...

...exist on the same level in the cluster graph or components that are free for **disassembly** after the removal of an included component from a higher level can be grouped into common clusters, where "included component" in this sense refers to a component that possesses identical **disassembly** tool options. The cluster graph for the washing machine valve showing all possible tool option...
...the dynamic model. The initial dynamic model for the washing machine valve with the given **disassembly** tool options is shown in Figure 4.

For clarity, nodes are located in the dynamic...example is run using a production run of 10,000 units. The costs for the **disassembly** of each node are added to the link directly following the node. This is denoted...

...between nodes a[sub]1 and d[sub]2 is the processing cost for the **disassembly** of the node a[sub]1 in 10,000 products. The investment costs (I) for...be completed through the dynamic program without further consideration of conflicting component accessibility during product **disassembly** .

Future work

Future research options for the improvement and expansion of the automatic tool selection...

...in automatic tool selection. This includes tool reliability, environmental aspectsand the required flexibility of the **disassembly** cell. Further, allowance can be made for disassembled components and sensitivity of the product being disassembled.
- Expanding the method to include not only non-destructive and partially destructive **disassembly** methods but also destructive methods of **disassembly** .

- To specify the cost parameters in a more precise fashion according to the properties of joining elements and the components to be disassembled.

- Integration into a **disassembly** planning methodology for the set up of facilities and their operation.

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Caption...

...for the tool represented by nodes a, d, g and h; Table II; Description of **disassembly** tool options for the washing machine valve sub-assembly; Figure 3; Cluster graph of the...

?